## REMARKS

Claims 1, 2, and 3 are pending in this application. Claim 1 is amended herein. Support for the amendment to claim 1 may be found in claim 1 as originally filed, as well as in Figs. 1 through 4. Reconsideration is requested based on the foregoing amendment and the following remarks.

Response to Arguments:

The Applicants acknowledge with appreciation the gracious consideration of their arguments.

Claim Rejections - 35 U.S.C. § 102:

Claims 1, 2, and 3 were rejected under 35 U.S.C. § 102(b) as anticipated by McNeely et al., US 6,296,020 (hereinafter McNeely '020). The rejection is traversed to the extent it would apply to the claims as amended.

The only similarity between the present invention and McNeely '020 is that both inventions relate to the design of the flow passage through a micro device. However, there are fundamental differences between the present invention and McNeely '020.

First, the objectives of the two inventions are different. The objective of McNeely '020 is to increase the pressure loss required to drive the flow, as described at column 5, line 52, whereas that of the present invention is to decrease the pressure loss.

Second, the inventions are applied to different flow regimes. McNeely '020 is designed to be applied to developing flow system driven by capillary forces, as described at column 5, line 53, where developing flow is an advancing stream of fluid that possesses a moving interface of solution and air or some other gas. The motion of flow is mainly governed by the contact angle, as described at column 5, line 57, which is determined by the liquid-solid wall interaction property, and the radius of the channel. However, the present invention is designed to established flow system, where there is no moving meniscus and only single phase (liquid or gas) exists inside the channel.

Third, the geometries are different from each other. McNeely '020 comprises branches of micro channels and flow barriers, as shown in Figs. 2-8 and 10, while the present invention comprises curved connecting channel which is effective in changing the flowing directions of the liquid in an angle in the range of 90 degrees to 180 degrees.

Furthermore, a micrometer is not merely a unit of measure like an inch or a foot, contrary to the assertion in the Office action at paragraph 3. Persons of skill in the art would recognize that flow phenomena in conventional macro-scale units and micro-scale units are completely different. First, the Reynolds numbers characterizing flow phenomena such as laminar and turbulent flows are completely different from each other.

Second, fluid-surface interactions at the molecular scale become very important in micro-scale channel resulting in fluid slip at the wall, whereas fluid slip does not exist in a macro-scale unit. Thermal creep, rarefaction, viscous dissipation, compressibility, intermolecular forces and other unconventional effects may have to be taken into account in a micro-scale channel.

Therefore, the micro-scale channel system must be considered as a completely new technology compared to the conventional pipe/channel system. For example, when the present invention is applied to a macro-scale pipe, the drag (or, pressure loss) significantly increases, which is the opposite of what we obtained (drag reduction) for a micro-scale unit.

The overall geometry of the present invention is a channel, whereas those of previous inventions are pipes. These two are completely different geometries. That is, the cross-sections of previous inventions are circles or similar, whereas that of the present invention is a rectangle with a high aspect ratio. It is not at all clear that an invention on a curved pipe system with a circular cross-section is valid for the geometry with a high-aspect-ratio rectangular cross-section because of the geometry difference. This is mainly because, while the circular cross-section can be broadened in all directions, the height of the rectangular cross-section of a micro channel installed in a so-called bio-chip should remain fixed and only the width can be broadened. Therefore, the present invention is far different from those associated with macro-scale pipes.

As discussed above, the present invention on a micro-scale channel is completely different from the previous ones on a macro-scale pipe.

In particular, claim 1 recites, in pertinent part:

"wherein the connecting channel is adapted to change flowing direction of the liquid in an angle in the range of 90 degrees to 180 degrees."

McNeely '020 neither teaches, discloses, nor suggests a connecting channel adapted to

change flowing direction of a liquid in an angle in the range of 90 degrees to 180 degrees, as recited in claim 1. McNeely '020, rather, shows at most oblique angles in channels 1 and 2, as may be seen in Figs. 2A-2J. Claim 1 is thus submitted to be allowable.

Claims 2 and 3 depend from claim 1 and add further distinguishing elements. Claims 2 and 3 are thus also submitted to be allowable. Withdrawal of the rejection of claims 2 and 3 is also earnestly solicited.

Conclusion:

In conclusion, the present invention is clearly distinguishable from McNeely '020 on both objective and structural aspects. Further, on the scale of the inventions, micro-scale channel system should be considered as a completely new technology from the conventional macro-scale pipe/channel system.

Finally, we would like to re-emphasize that the present invention had been reported and praised in prestigious international conferences [references 1, 2], at which all the papers are reviewed for the presentation and only new results can be presented.

Accordingly, in view of the reasons given above, it is submitted that all claims 1, 2, and 3 are allowable over the cited references. Allowance of all claims 1, 2, and 3 and of this entire application are therefore respectfully requested.

Respectfully submitted,

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